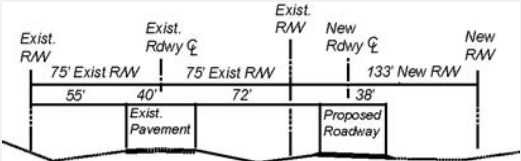
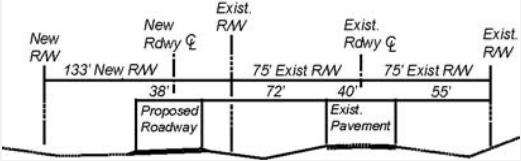
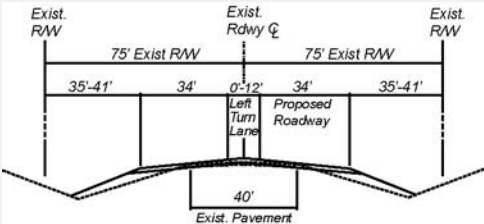
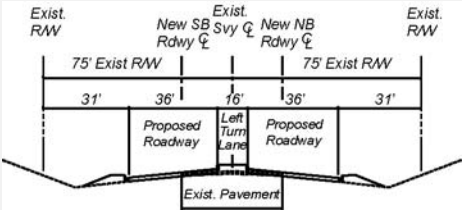
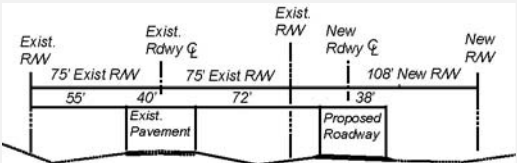
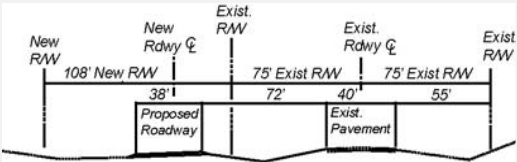


APPENDIX A. ALTERNATIVES

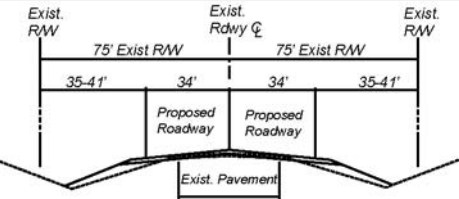
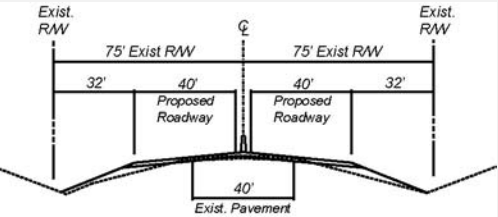
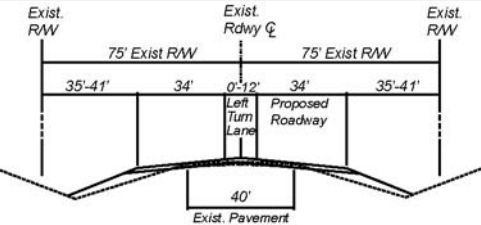
Antelope Hills (MP 442.0 – MP 443.0) Build Alternatives

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<p>Widen to East Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- R/W/easement required for desired typical section (133 feet additional width).	<ul style="list-style-type: none">- Potential impact to one cultural resources site considered potentially eligible for the National Register of Historic Places (NRHP).- Economic impact created by loss of two businesses.- Potential hazardous materials concerns from petroleum products and aboveground storage tanks associated with commercial development at Antelope Hills.- Potential noise impacts to six mobile homes.	<ul style="list-style-type: none">- Relocation of telephone line running adjacent and parallel to the existing R/W/easement.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- R/W/easement costs.- Telephone line relocation.- Mitigation costs for impacted businesses.
<p>Widen to West Alternative</p> <p>Four-lane divided roadway with 84-foot median with southbound lanes west of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- R/W/easement required for desired typical section (133 feet additional width).	<ul style="list-style-type: none">- Potential impact to two cultural resource sites considered potentially eligible for the NRHP.- Economic impact created by loss of one business at Antelope Hills.- Potential hazardous materials concerns from petroleum products and aboveground storage tanks associated with commercial development at Antelope Hills.	<ul style="list-style-type: none">- MP 442.1: Possible relocation of two transmission towers.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- R/W/easement costs.- Mitigation costs for impacted businesses.
<p>Five-lane Undivided Alternative</p> <p>Two lanes in each direction with a two-way center left-turn lane centered on the existing centerline.</p> <p>– Selected –</p>		<ul style="list-style-type: none">- No R/W/easement required.	<ul style="list-style-type: none">- Potential impact to two cultural resource sites considered potentially eligible for the NRHP.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Continuous center left-turn lane used as passing lane offers no median to separate opposing traffic.- Potential for motorists to use the continuous center left-turn lane as a passing lane.	<ul style="list-style-type: none">- More difficult to construct.	<ul style="list-style-type: none">- No R/W/easement costs.
<p>Four-lane Divided Alternative</p> <p>Two lanes in each direction with a 16-foot raised median and left-turn bays centered on the existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- No R/W/easement required.	<ul style="list-style-type: none">- Potential impact to two cultural resource sites considered potentially eligible for the NRHP.- Potential impact to business access.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Raised median separates opposing traffic.- Clear zone requirements and driveway spacing not conducive to existing 65 mph speed limit.	<ul style="list-style-type: none">- Greater traffic control issues	<ul style="list-style-type: none">- No R/W/easement costs.

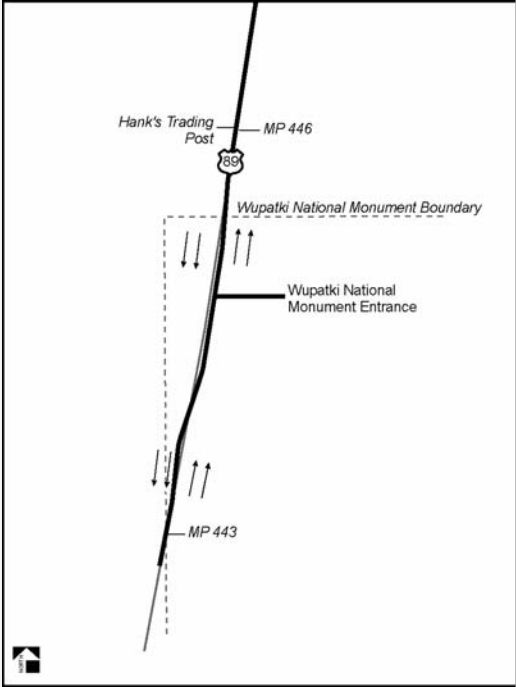
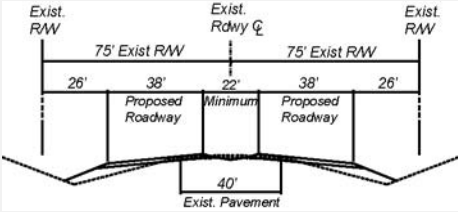
Wupatki National Monument (MP 443.0 – MP 445.4) Build Alternatives

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<p>Widen to East Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired easement.- Easement required for desired typical section (108 feet additional width) approximately 37 acres from Monument.	<ul style="list-style-type: none">- Potential impact to five cultural resources sites considered eligible/potentially eligible for NRHP.- Direct impact to Section 4(f) resource (Wupatki National Monument) from approximately MP 442.9 to MP 445.4.- Prairie dog/black-footed ferret: approximately 40 acres of new habitat loss; possible increased mortality of animals crossing road because of increased roadway width; however, median may provide temporary safe zone while crossing.- Grasslands: approximately 40 acres of new habitat loss.- Pronghorn: approximately 40 acres of new habitat loss; possible increased mortality of pronghorn attempting to cross road (or decreased attempted crossings) because of increased roadway width; median may provide a temporary safe zone while crossing; however, the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.- Notable change in the visual character of the landscape for motorists. Moderate negative long-term change in the scenic integrity of the landscape for motorists.- No change in Monument visitor experience.- No economic impacts to Hank’s Trading Post.- No potential for private development along US 89 roadway.	<ul style="list-style-type: none">- Relocation of telephone line running parallel to and east of the existing easement.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.- Monument entrance remains at existing location.- No out-of-direction travel for Monument visitors.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Easement costs.- Telephone line relocation.
<p>Widen to West Alternative</p> <p>Four-lane divided roadway with 84-foot median with southbound lanes west of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired easement.- Easement required for desired typical section (108 feet additional width); approximately 37 acres from Monument.	<ul style="list-style-type: none">- Potential impact to nine cultural resources sites considered potentially eligible/eligible for NRHP.- Direct impact to Section 4(f) resource (Wupatki National Monument) from approximately MP 444.5 to MP 445.0.- Prairie dog/black-footed ferret: approximately 40 acres of new habitat loss; possible increased mortality of animals crossing road because of increased roadway width; however, median may provide temporary safe zone.- Grasslands: approximately 40 acres of new habitat loss.- Pronghorn: approximately 40 acres of new habitat loss; possible increased mortality of pronghorn attempting to cross road (or decreased attempted crossings) because of increased roadway width; median may provide a temporary safe zone while crossing; however the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.- Notable change in the visual character of the landscape for motorists. Moderate negative long-term change in the scenic integrity of the landscape for motorists.- No change in Monument visitor experience except at entrance. Notable modification to the landform at Monument entrance.- Economic impact from loss of one business structure at Hank’s Trading Post.- Potential hazardous materials concerns at Hank’s Trading Post from petroleum products associated with commercial development.- Relocation of one residence and two mobile homes at Hank’s Trading Post.- No potential for private development along US 89 roadway.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.- Monument entrance remains at existing location.- No out-of-direction travel for Monument visitors.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Easement costs.

Wupatki National Monument (MP 443.0 – MP 445.4) Build Alternatives (continued)

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<div>Four-lane Undivided Alternative</div> <div>Two lanes in each direction.</div> <div>– Eliminated –</div>		<div>- No impacts to existing grazing lands.</div> <div>- No easement required.</div>	<div>- Potential impact to 11 cultural resources sites considered potentially eligible/eligible for the NRHP.</div>	<div>- No apparent conflicts.</div>	<div>- No median to separate opposing traffic.</div> <div>- No refuge for left-turn movements.</div> <div>- Possible delays to through-traffic during periods of high traffic volume.</div>	<div>- More difficult to construct.</div>	<div>- No easement costs.</div>
<div>Four-lane Divided with Median Barrier on Existing Alignment Alternative</div> <div>Two lanes in each direction with a center median barrier and left-turn bays on the existing centerline.</div> <div>– Eliminated –</div>		<div>- No impacts to private lands/grazing.</div> <div>- No easement required from Monument.</div>	<div>- Impact six NRHP-eligible cultural resources sites that extend into existing ADOT easement. Most previously impacted by road construction. One possible Hopi TCP (portion of site outside easement).</div> <div>- Prairie dog/black-footed ferret: no new habitat fragmentation or loss; possible increased mortality of animals crossing road if blocked by solid median barrier.</div> <div>- Grasslands: no new habitat loss.</div> <div>- Pronghorn: no new habitat fragmentation or loss; absolute barrier to pronghorn crossing the roadway (no matter the type of median barrier used); possible increased mortality of pronghorn attempting to cross road when blocked by median barrier; however, the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.</div> <div>- Notable change in the visual character of the landscape for motorists. Moderate negative long-term change in the scenic integrity of the landscape for motorists.</div> <div>- No change in Monument visitor experience except at entrance.</div> <div>- No economic impacts to Hank's Trading Post.</div> <div>- No potential for private development along US 89 roadway.</div> <div>- No direct impact to Section 4(f) property (Monument).</div>	<div>- No apparent conflicts.</div>	<div>- Monument entrance remains at existing location.</div> <div>- Meets ADOT's design objective to separate opposing traffic with a median barrier to reduce accident rates.</div> <div>- No out-of-direction travel for Monument visitors.</div>	<div>- More difficult to construct.</div>	<div>- Easement costs.</div>
<div>Five-lane on Existing Alignment Alternative</div> <div>Two lanes in each direction with a two-way center left-turn lane centered on existing centerline.</div> <div>– Eliminated –</div>		<div>- No impacts to private lands/grazing.</div> <div>- No R/W required.</div>	<div>- Impact to six NRHP-eligible cultural resources sites that extend into existing ADOT easement. Most previously impacted by road construction. One possible Hopi TCP (portion of site outside easement).</div> <div>- Prairie dog/black-footed ferret: no new habitat fragmentation or loss; possible increased mortality of animals crossing road because of loss of safe zone in median.</div> <div>- Grasslands: no new habitat loss.</div> <div>- Pronghorn: no new habitat fragmentation or loss; five-lane section requires animals to cross all lanes of traffic in one move; however the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.</div> <div>- Subtle change in the visual character of the landscape for motorists.</div> <div>- No change in Monument visitor experience.</div> <div>- No economic impacts to Hank's Trading Post.</div> <div>- No potential for private development along US 89 roadway.</div>	<div>- No apparent conflicts.</div>	<div>- Monument entrance remains at existing location.</div> <div>- Does not meet ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.</div> <div>- No out-of-direction travel for Monument visitors.</div>	<div>- More difficult to construct.</div>	<div>- No R/W/easement costs.</div> <div>- Costs for removing existing pavement and grade.</div>

Wupatki National Monument (MP 443.0 – MP 445.4) Build Alternatives (continued)

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<p>Four-lane Divided with 84-foot Median Avoiding Monument Entrance Landform Alternative</p> <p>Four-lane divided roadway with 84-foot median and widening to the west then shifting to the east to avoid landform at Monument entrance.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Loss of grazing area.- Easement required for desired typical section (108 feet additional width); approximately 29 acres from Monument.	<ul style="list-style-type: none">- Impact seven NRHP-eligible cultural resources sites that extend into existing ADOT R/W/easement. Most previously impacted by road construction. One possible Hopi TCP (portion of site outside easement).- Prairie dog/black-footed ferret: approximately 29 acres of new habitat loss; possible increased mortality of animals crossing road because of increased roadway width; however, median may provide temporary safe zone while crossing.- Grasslands: approximately 29 acres of new habitat loss.- Pronghorn: approximately 29 acres of new habitat loss; possible increased mortality of pronghorn attempting to cross road (or decreased attempted crossings) because of increased roadway width; median may provide a temporary safe zone while crossing; however the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.- Subtle change in the visual character of the landscape for motorists. Minor negative long-term change in the scenic integrity of the landscape for motorists.- No change in Monument visitor experience.- No economic impacts to Hank's Trading Post.- No potential for private development along US 89 roadway.- Direct impact to Section 4(f) property (Monument).	<ul style="list-style-type: none">- Relocation of the telephone line in the vicinity of the Monument entrance, where widening occurs to the east.	<ul style="list-style-type: none">- Monument entrance shifted to the east of the existing location.- Meets ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.- No out-of-direction travel for Monument visitors.	<ul style="list-style-type: none">- Easier to construct in areas where the median provides a buffer between traffic and construction.- Greater traffic control and detours necessary in areas where roadway transitions from western to eastern widening.	<ul style="list-style-type: none">- Easement costs.- Telephone line relocation.
<p>Four-lane Divided with 30-foot Median Alternative</p> <p>Four-lane divided roadway with 22-foot median centered on the existing centerline.</p> <p>– Selected –</p>		<ul style="list-style-type: none">- No impacts to private lands/grazing.- No easement required from Monument.	<ul style="list-style-type: none">- Impact six NRHP-eligible cultural resources sites that extend into existing ADOT R/W/easement. Most previously impacted by road construction. One possible Hopi TCP (portion of site outside easement).- Prairie dog/black-footed ferret: no new habitat fragmentation or loss; possible increased mortality of animals crossing road because of loss of safe zone in median.- Grasslands: no new habitat loss.- Pronghorn: no new habitat fragmentation or loss; narrow median results in shorter total distance for animal crossing but eliminates potential safe zone in median and requires animals to cross all lanes of traffic in one move; however, the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.- Subtle change in the visual character of the landscape for motorists. Minor negative long-term change in the scenic integrity of the landscape for motorists.- No change in Monument visitor experience except at entrance. Notable modification to the landform at Monument entrance.- No economic impacts to Hank's Trading Post.- No potential for private development along US 89 roadway.- No direct impact to Section 4(f) property (Monument).	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Monument entrance remains at existing location.- Does not meet ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.- No out-of-direction travel for Monument visitors.	<ul style="list-style-type: none">- More difficult to construct.	<ul style="list-style-type: none">- No R/W/easement costs.- Costs for removing existing pavement and grade.

Wupatki National Monument (MP 443.0 – MP 445.4) Build Alternatives (continued)

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<div>Western Realignment Alternative A</div> <div>Southbound traffic bypasses Monument to west and enters Monument from south end; northbound traffic continues on existing US 89 roadway.</div> <div>– Eliminated –</div>		<div>- Impacts to private lands/grazing.</div> <div>- Easement required (200-foot width): approximately 78 acres, of which no acreage is on Monument land.</div>	<div>- Impact to seven known NRHP-eligible cultural resources sites. Potential impact to an estimated four previously unidentified sites.</div> <div>- Prairie dog/black-footed ferret: approximately 78 acres of new habitat loss; increased habitat fragmentation by isolating 100s of acres of habitat between two widely separated lanes of traffic; possible increased mortality of animals crossing road and increased crossing attempts because animals will persist within the extra-wide median surrounded by lanes of traffic.</div> <div>- Grasslands: approximately 78 acres of new habitat loss; increased potential for exotic plant species to disperse into grassland with new ground disturbance and seed dispersal corridor widely separated from existing roadway.</div> <div>- Pronghorn: approximately 78 acres of new habitat loss; increased habitat fragmentation by isolating 100s of acres of habitat between two widely separated lanes of traffic; possible decreased attempted crossings because of two, two-lane roadways to be crossed; median may provide a temporary safe zone while crossing; however, the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.</div> <div>- Potential for private development on western boundary of Wupatki causing additional habitat loss and disturbance to prairie dogs/black-footed ferrets, grasslands, and pronghorn.</div> <div>- Substantial change in the visual character of the landscape. Moderate to major negative long-term change in the scenic integrity of the landscape.</div> <div>- No change in Monument visitor experience.</div> <div>- Potential economic impact to Hank's Trading Post because of access changes.</div> <div>- Potential for induced private development along US 89/ Monument's western boundary.</div> <div>- No direct impact to Section 4(f) property (Wupatki National Monument).</div>	<div>- No apparent conflicts.</div>	<div>- Monument entrance remains at existing location.</div> <div>- Southbound vehicles would have to crossover to the northbound lanes south of the Monument boundary and travel north to the existing entrance at MP 444.8.</div> <div>- Approximately 0.2 mile out-of-direction travel for US 89 motorists.</div> <div>- Meets ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.</div> <div>- Out-of-direction travel for southbound traffic entering Monument.</div> <div>- New crossovers needed at the north and south connections.</div>	<div>- Easier to construct as new lanes are located on a separate alignment from existing traffic, except for connections to existing roadway.</div>	<div>- Extensive easement requirements.</div> <div>- New drainage facilities for southbound lanes.</div>

Wupatki National Monument (MP 443.0 – MP 445.4) Build Alternatives (continued)

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<div>Western Realignment Alternative B</div> <div>Both south- and northbound traffic bypass Monument on west side, entering and exiting Monument from south end using existing US 89 roadway.</div> <div>– Eliminated –</div>		<div>- Impacts to private lands/grazing.</div> <div>- Easement required (308-foot width): approximately 124 acres, of which no acreage is on Monument land.</div>	<div>- Impact to 20 NRHP-eligible cultural resources sites.</div> <div>- Prairie dog/black-footed ferret: approximately 124 acres of new habitat loss; increased habitat fragmentation by isolating 100s of acres of habitat between new four-lane roadway and Wupatki entrance road; possible increased mortality of animals crossing four-lane roadway; however, median may provide temporary safe zone while crossing.</div> <div>- Grasslands: approximately 124 acres of new habitat loss; increased potential for exotic plant species to disperse into grassland with new ground disturbance and seed dispersal corridor widely separated from existing roadway; rehabilitation of roadway north of Wupatki entrance returns some habitat acreage, though not pristine.</div> <div>- Pronghorn: approximately 124 acres of new habitat loss; however, rehabilitation of existing road north of Wupatki entrance will reduce total acres of lost habitat; increased habitat fragmentation by isolating 100s of acres of habitat between new four-lane roadway and Wupatki entrance road; possible decreased attempted crossings because of new four-lane highway parallel to entrance road; median in highway may provide a temporary safe zone for animals while crossing; however, the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.</div> <div>- Potential for private development on western boundary of Wupatki causing additional habitat loss and disturbance to prairie dogs/black-footed ferrets, grasslands, and pronghorn.</div> <div>- Substantial change in the visual character of the landscape. Moderate to major negative long-term change in the scenic integrity of the landscape.</div> <div>- No change in Monument visitor experience.</div> <div>- Possible economic impact to Hank's Trading Post because of access changes.</div> <div>- Potential for induced private development along US 89/ Monument's western boundary.</div> <div>- No direct impact to Section 4(f) property (Wupatki National Monument).</div>	<div>- No apparent conflicts.</div>	<div>- Monument entrance remains at existing location.</div> <div>- Southbound vehicles would travel to the south end of the Monument and travel north to the existing entrance at MP 444.8.</div> <div>- Northbound vehicles leaving the Monument would travel to the south end of the Monument and then travel north on US 89.</div> <div>- Approximately 0.2 miles out-of-direction travel for US 89 motorists.</div> <div>- Meets ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.</div> <div>- Out-of-direction travel for north- and southbound traffic.</div> <div>- New crossovers need to be constructed at the south end.</div>	<div>- Easier to construct as new roadway is well-separated from existing traffic.</div>	<div>- More extensive easement requirements than Western Realignment Alternative A.</div> <div>- Four lanes and new drainage facilities on a totally new alignment.</div>

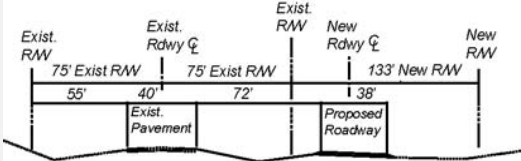
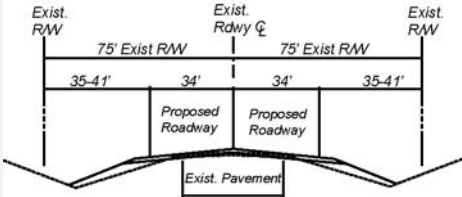
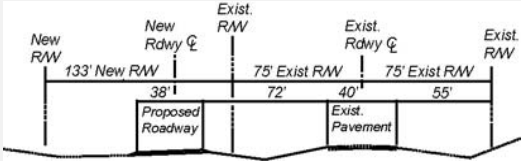
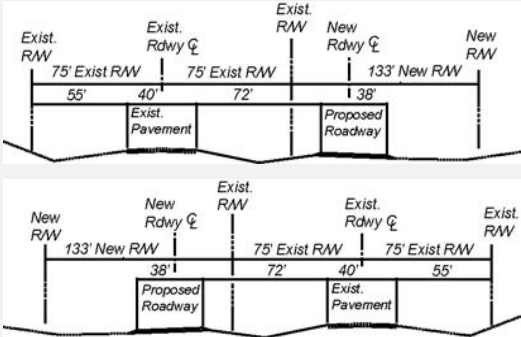
Wupatki National Monument (MP 443.0 – MP 445.4) Build Alternatives (continued)

Consideration		Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
Alternative							
<div><div>Western Realignment Alternative C</div><div>Both south- and northbound traffic bypass Monument on west side, entering and exiting Monument from north end using existing US 89 roadway. – Eliminated –</div></div>		<ul style="list-style-type: none">- Impacts to private lands/grazing.- Easement required (308-foot width): approximately 124 acres, of which no acreage is on Monument land.	<ul style="list-style-type: none">- Impact to 20 NRHP-eligible cultural resources sites.- Prairie dog/black-footed ferret: approximately 124 acres of new habitat loss; increased habitat fragmentation because of new four-lane roadway; rehabilitation of roadway south of Wupatki entrance returns some habitat acreage and reduces fragmentation; possible increased mortality of animals crossing four-lane roadway; however, median may provide temporary safe zone while crossing.- Grasslands: approximately 124 acres of new habitat loss; increased potential for exotic plant species to disperse into grassland with new ground disturbance and seed dispersal corridor widely separated from existing roadway; rehabilitation of roadway south of Wupatki entrance returns some habitat acreage though not pristine.- Pronghorn: approximately 124 acres of new habitat loss; rehabilitation of existing road south of Wupatki entrance will reduce habitat loss; possible reduction in crossing attempts north of Wupatki entrance because of parallel roadways; possible increased mortality of animals crossing highway (and/or decreased attempted crossings) because of new four-lane roadway; median between opposing travel lanes may provide a temporary safe zone while crossing; however the presence of R/W fencing precludes virtually all roadway crossings by pronghorn; possible location of roadway crossing structure compromised by potential private development.- Potential for private development on western boundary of Wupatki causing additional habitat loss and disturbance to prairie dogs/black-footed ferrets, grasslands, and pronghorn.- Substantial change in the visual character of the landscape. Moderate to major negative long-term change in the scenic integrity of the landscape.- No change in Monument visitor experience.- Possible economic impact to Hank's Trading Post because of access changes.- Potential for induced private development along US 89/ Monument's western boundary.- No direct impact to Section 4(f) property (Wupatki National Monument).	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Monument entrance remains at existing location.- Northbound vehicles would travel to the north end of the Monument and travel south to the existing entrance at MP 444.8. Approximately 0.2 miles out-of-direction travel for US 89 motorists.- Meets ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.- Out-of-direction travel for north- and southbound traffic.- New crossovers need to be constructed at the south end.	<ul style="list-style-type: none">- Easier to construct as new roadway is well-separated from existing traffic.	<ul style="list-style-type: none">- More extensive easement requirements than Western Realignment Alternative A.- Four lanes and new drainage facilities on a totally new alignment.

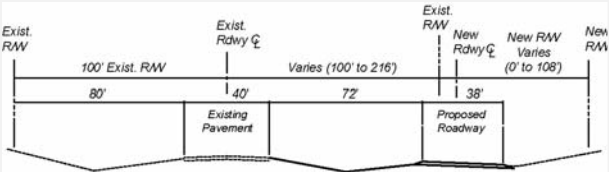
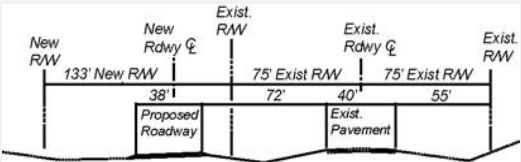
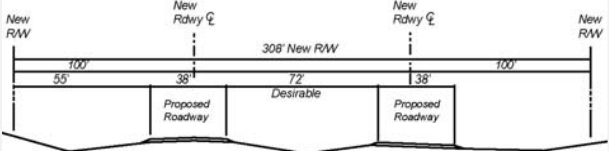
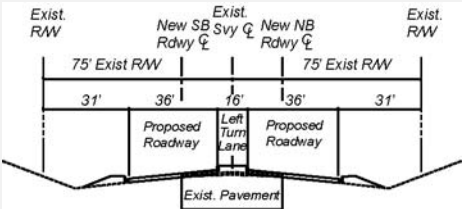
Wupatki National Monument (MP 443.0 – MP 445.4) Build Alternatives (continued)

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<div>Western Realignment Alternative D</div> <div>Both south- and northbound traffic bypass Monument on west side, entering and exiting Monument from north and south ends using existing US 89 roadway.</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Impacts to private lands/grazing.- Easement required (308-foot width): approximately 124 acres, of which no acreage is on Monument land.	<ul style="list-style-type: none">- Impact to 20 NRHP-eligible cultural resources sites.- Prairie dog/black-footed ferret: approximately 124 acres of new habitat loss; increased habitat fragmentation by isolating 100s of acres between two widely separated lanes of traffic; possible increased animal mortality from increased crossing attempts because animals will persist between the two roadways.- Grasslands: approximately 124 acres of new habitat loss; increased potential for exotic plant species to disperse into grassland with new ground disturbance and seed dispersal corridor widely separated from existing roadway.- Pronghorn: approximately 124 acres of new habitat loss; increased habitat fragmentation by isolating 100s of acres between two widely separated lanes of traffic; possible decreased attempted crossings by animals because of two parallel roadways to be crossed; wider median of highway may provide a temporary safe zone while crossing; however, the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.- Potential for private development on western boundary of Wupatki causing additional habitat loss and disturbance to prairie dogs/black-footed ferrets, grasslands, and pronghorn.- Substantial change in the visual character of the landscape. Moderate to major negative long-term change in the scenic integrity of the landscape.- No change in Monument visitor experience.- Possible economic impact to Hank's Trading Post because of access changes.- Potential for induced private development along US 89/Monument's western boundary.- No direct impact to Section 4(f) property (Wupatki National Monument).	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Monument entrance remains at existing location.- No out-of-direction travel to Monument; approximately 0.2 mile out-of-direction travel for US 89 motorists.- New intersections needed at both the north and south connections to the existing highway.- Meets ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.	<ul style="list-style-type: none">- Easier to construct as new roadway is well-separated from existing traffic.	<ul style="list-style-type: none">- More extensive easement requirements than Western Realignment Alternative A.- Four lanes and new drainage facilities on a totally new alignment.
<div>Western Realignment Alternative E</div> <div>Both south- and northbound traffic bypass Monument on 230 kV transmission line alignment, entering and exiting Monument from north end using existing US 89 roadway.</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Impacts to private lands/grazing.- Easement required (308-foot width): approximately 193 acres, of which no acreage is on Monument land.	<ul style="list-style-type: none">- Impact to cultural resources site not known; area has not been surveyed for cultural resources.- Prairie dog/black-footed ferret: approximately 193 acres of new habitat loss; increased habitat fragmentation by isolating 100s of acres between two widely separated lanes of traffic; possible increased animal mortality from increased crossing attempts because animals will persist between the two roadways.- Grasslands: approximately 193 acres of new habitat loss; increased potential for exotic plant species to disperse into grassland with new ground disturbance and seed dispersal corridor widely separated from existing roadway.- Pronghorn: approximately 193 acres of new habitat loss; increased habitat fragmentation by isolating 100s of acres between two widely separated lanes of traffic; possible decreased attempted crossings by animals because of two parallel roadways to be crossed; wider median of highway may provide a temporary safe zone while crossing; however the presence of R/W fencing precludes virtually all roadway crossings by pronghorn.- Substantial change in the visual character of the landscape. Moderate to major negative long-term change in the scenic integrity of the landscape.- No change in Monument visitor experience.- Possible economic impact to Hank's Trading Post because of access changes.- No direct impact to Section 4(f) property (Wupatki National Monument).	<ul style="list-style-type: none">- Need to avoid impacts to power transmission line and towers.	<ul style="list-style-type: none">- Monument entrance remains at existing location.- No out-of-direction travel to Monument; approximately 2 miles out-of-direction travel for US 89 motorists.- New intersections needed at both the north and south connections to the existing highway.- Meets ADOT's design objective for projected increase in traffic.- Meets ADOT's design objective to separate opposing traffic with a wider median on divided highway to reduce accident rates.	<ul style="list-style-type: none">- Easier to construct as new roadway is well-separated from existing traffic.	<ul style="list-style-type: none">- Most expensive option because of total length of new roadway to be constructed.- Most extensive easement acquisition of all alternatives.

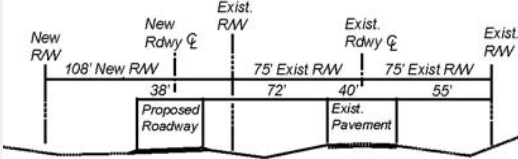
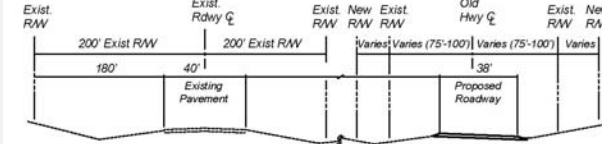
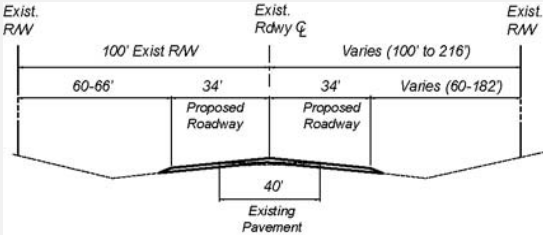
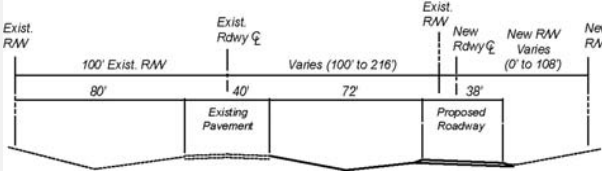
Wupatki National Monument to Gray Mountain (MP 445.4 – MP 456.0) Build Alternatives

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<p>Widen to East Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired R/W.- R/W required for desired typical section (133 feet additional width).	<ul style="list-style-type: none">- Impact to two NRHP-eligible cultural resources sites.- Relocation of Babbitt Ranches stone monument sign near MP 452.1.- Potential visual impacts between MP 453.0 and MP 453.2 and between MP 454.0 and MP 454.5 created by disturbance to rock outcrops and notable landscape modification (cut slopes) from MP 447.0 to MP 450.0.	<ul style="list-style-type: none">- Relocation of telephone line running parallel to and east of the existing R/W.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- R/W costs.- Telephone line relocation costs.
<p>Four-lane Undivided Alternative</p> <p>Two lanes in each direction.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- No impacts to existing grazing lands.- No R/W required.	<ul style="list-style-type: none">- No known substantial impacts.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- No median to separate opposing traffic.- No refuge for left-turn movements. Possible delays to through-traffic during periods of high traffic volume.	<ul style="list-style-type: none">- More difficult to construct.	<ul style="list-style-type: none">- No R/W costs.
<p>Widen to West Alternative</p> <p>Four-lane divided roadway with 84-foot median with southbound lanes west of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired R/W.- R/W required for desired typical section (133 feet additional width).	<ul style="list-style-type: none">- Potential direct impact to one historic property considered to be Section 4(f) resource.- Economic impact created by loss of one business at Wauneta Trading Post and one at Hank's Trading Post.- Potential hazardous materials concerns at Hank's Trading Post and at Wauneta Trading Post from petroleum products associated with commercial development.- Relocation of one residence and two mobile homes at Hank's Trading Post.- Potential noise impacts to one mobile home at Wauneta Trading Post.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- R/W costs.- Mitigation costs for impacted businesses.
<p>Widen to West and East Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes west of existing centerline except between MP 445.4 to MP 447.0 and between MP 451.7 and MP 453.2 where widening will be to the east.</p> <p>– Selected –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired R/W.- R/W required for desired typical section (133 feet additional width).	<ul style="list-style-type: none">- Relocation of Babbitt Ranches stone monument sign near MP 452.1.- Potential visual impacts between MP 453.0 and MP 453.2 created by disturbance to rock outcrops.	<ul style="list-style-type: none">- Relocation of 3.8 miles of telephone line running parallel to and east of the existing R/W.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- R/W costs.- Telephone line relocation costs.- No mitigation costs for impacted businesses.

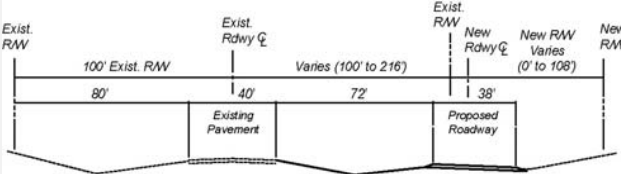
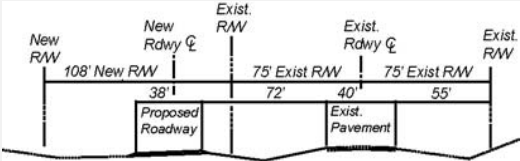
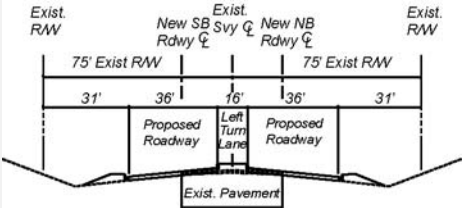
Gray Mountain (MP 456.0 – MP 458.1) Build Alternatives

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to private lands/grazing	Environmental impacts	Vehicle/pedestrian conflicts	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<p>Widen to East Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired R/W/easement.- R/W/easement required for desired typical section (133 feet additional width).	<ul style="list-style-type: none">- Economic impact created by loss of two businesses at Gray Mountain.- Potential relocation of one residence and one church in Gray Mountain.- Potential hazardous materials concerns at Gray Mountain from petroleum products and aboveground storage tanks associated with commercial businesses.- Potential noise impacts to two residences in Gray Mountain.		<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- R/W/easement costs.- Mitigation costs for relocated businesses and residences.
<p>Widen to West Alternative</p> <p>Four-lane divided roadway with 84-foot median with southbound lanes west of existing centerline.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired R/W/easement.- R/W/easement required for desired typical section (133 feet additional width).	<ul style="list-style-type: none">- Economic impact created by loss of one business at Gray Mountain.- Potential noise impacts to four residences near Gray Mountain.		<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- R/W/easement costs.- Mitigation costs for one relocated business.
<p>Gray Mountain Bypass Alternative</p> <p>Four-lane divided roadway with 84-foot median east of Gray Mountain.</p> <p>– Eliminated –</p>		<ul style="list-style-type: none">- Splits up existing grazing areas with the new roadway alignment.- R/W/easement required (308-foot width).	<ul style="list-style-type: none">- Possible economic impact to Gray Mountain businesses (no more through traffic).- Potential impact to one cultural resource site considered potentially eligible for the NRHP.	<ul style="list-style-type: none">- Potential vehicle/pedestrian conflicts are minimized.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.- Introduces additional curves into alignment.	<ul style="list-style-type: none">- Fewest conflicts with US 89 traffic.	<ul style="list-style-type: none">- Highest R/W/easement costs.- New roadway for over 2 miles.
<p>Four-lane Divided Alternative</p> <p>Two lanes in each direction with a 16-foot raised median and left-turn bays centered on the existing centerline.</p> <p>– Selected –</p>		<ul style="list-style-type: none">- No impacts to existing grazing lands.- No R/W/easement required.	<ul style="list-style-type: none">- Relocation of parking lot within existing ADOT R/W at Gray Mountain Café.	<ul style="list-style-type: none">- Raised median island provides pedestrian refuge.	<ul style="list-style-type: none">- Does not accommodate desirable median width of 84 feet.	<ul style="list-style-type: none">- Greater traffic control issues.	<ul style="list-style-type: none">- Lowest construction cost.

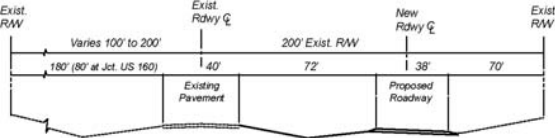
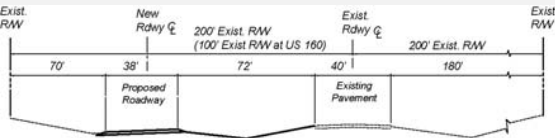
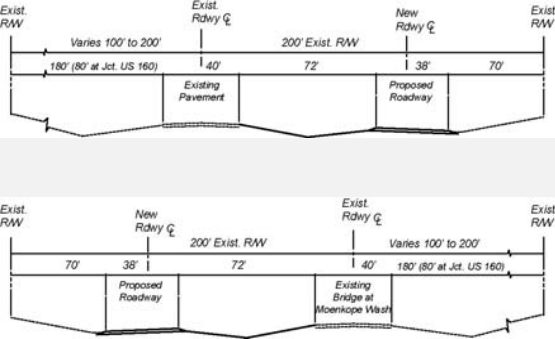
Gray Mountain to Junction SR 64 (MP 458.1 – MP 464.0) Build Alternatives

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to Navajo Nation lands/grazing	Environmental impacts	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<div>Widen to West Alternative</div> <div>Four-lane divided roadway with 84-foot median with southbound lanes west of existing centerline.</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Loss of grazing area to acquired easement.- New R/W/easement required (108-foot additional width).	<ul style="list-style-type: none">- Section 404 permit/401 certification required at numerous drainage crossings.- Potential economic impact for relocation of one roadside stand.	<ul style="list-style-type: none">- Overhead transmission line towers impacted.	<ul style="list-style-type: none">- Desired median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Highest easement costs.
<div>Old US 89 Highway Alignment Alternative</div> <div>Northbound lanes located on Old US 89 alignment and southbound lanes on existing roadway.</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Isolates land between the old highway easement and existing easement.- Up to 50 feet additional width needed.- Old US 89 easement ranges from 150 feet to 200 feet from MP 459.2 to MP 460.5).	<ul style="list-style-type: none">- Portions of Old US 89 easement have not been surveyed for cultural or biological resources.- Potential impact to two known cultural resource site considered potentially eligible for the NRHP.- Potential Individual 404 Permit where roadways cross the same wash at different locations.- Separation of roadways maintains existing visual character of two-lane rural highway.- Potential additional fragmentation and loss of habitat.	<ul style="list-style-type: none">- Overhead power poles within old easement north of Gray Mountain.	<ul style="list-style-type: none">- Wide median separates northbound and southbound traffic.- Introduces additional curves into alignment.	<ul style="list-style-type: none">- Easier to construct, with buffer between traffic and new construction.	<ul style="list-style-type: none">- Easement costs.- Utility relocation costs.
<div>Four-lane Undivided Alternative</div> <div>Two lanes in each direction.</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- No impact to grazing area.- No easement required.	<ul style="list-style-type: none">- Potential impact to one cultural resources site considered potentially eligible for the NRHP.- Section 404 permit/401 certification required at numerous drainage crossings.		<ul style="list-style-type: none">- No median to separate opposing traffic.	<ul style="list-style-type: none">- More difficult to construct.	
<div>Widen to East Alternative</div> <div>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline.</div> <div>– Selected –</div>		<ul style="list-style-type: none">- Loss of grazing area to acquired easement.- New easement required in some sections (additional width varies from 0 to 108 feet).	<ul style="list-style-type: none">- Potential impact to one cultural resource site considered potentially eligible for the NRHP.- Section 404 permit/401 certification required at numerous drainage crossings.- Potential relocation of Navajo Nation monument sign near MP 458.0.- Potential economic impact for relocation of two roadside stands.		<ul style="list-style-type: none">- Provides desired median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Easement costs.

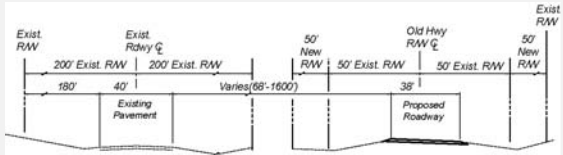
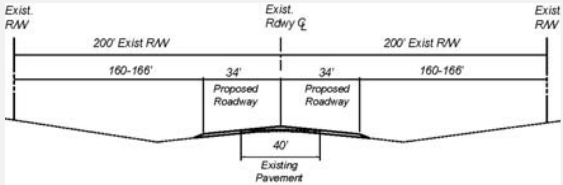
Junction SR 64 to Little Colorado River (MP 464.0 – MP 467.1) Build Alternatives

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to Navajo Nation lands/grazing	Environmental impacts	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<p>Widen to East Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline.</p> <p>– <i>Eliminated</i> –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired easement.- New easement required in some sections: 28 feet additional width from MP 465.0 to MP 467.0; 60 feet additional width from MP 464.6 to MP 465.0.- Direct impact to Little Colorado River Tribal Park.	<ul style="list-style-type: none">- Economic impact created by loss of four businesses at Cameron.- Potential hazardous materials concerns at Cameron from petroleum products and underground storage tanks associated with commercial development.- Potential noise impacts 24 residences at Cameron.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Easement costs.- Mitigation costs for relocated businesses.- Potential additional costs for hazardous material remediation.
<p>Widen to West Alternative</p> <p>Four-lane divided roadway with 84-foot median with southbound lanes west of existing centerline.</p> <p>– <i>Eliminated</i> –</p>		<ul style="list-style-type: none">- Loss of grazing area to acquired R/W/easement.- New easement required (108 feet additional width).- Direct impact to Little Colorado River Tribal Park.	<ul style="list-style-type: none">- Economic impact created by loss of three businesses at Cameron.- Potential relocation of five residences and one visitor center in Cameron.- Potential impact to one cultural resources site listed in the NRHP and one potentially eligible.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Highest R/W/easement costs.- Mitigation costs for relocated businesses and residences.
<p>Four-lane Divided Alternative</p> <p>Two lanes in each direction with a 16-foot raised median and left-turn bays centered on the existing centerline.</p> <p>– <i>Selected</i> –</p>		<ul style="list-style-type: none">- No grazing impacts.- No easement required.	<ul style="list-style-type: none">- Potential noise impacts to six residences at Cameron.- Potential impact to one cultural resource site listed in the NRHP.	<ul style="list-style-type: none">- Raised median to separate opposing traffic.	<ul style="list-style-type: none">- More difficult to construct new roadway over existing roadway footprint.	

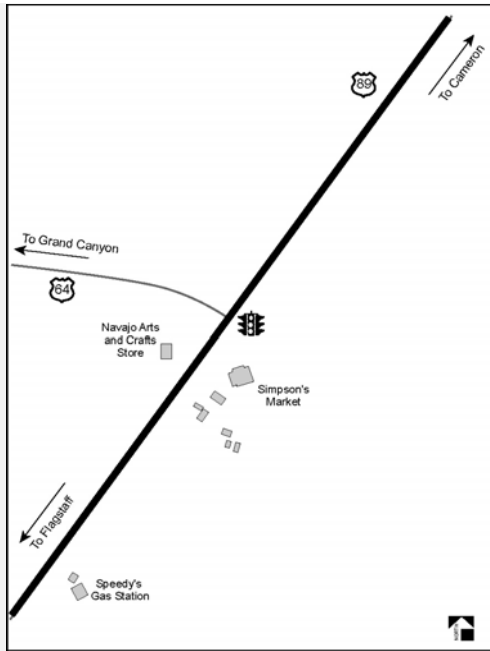
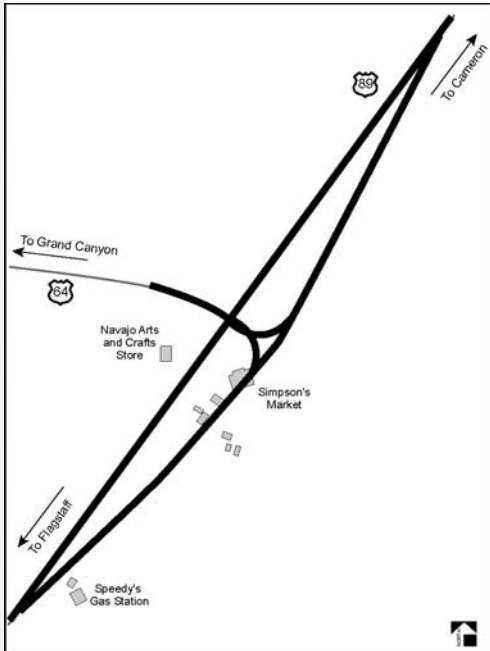
Little Colorado River to Junction US 160 (MP 467.1 – MP 481.9) Build Alternatives

Alternative	Consideration	Right-of-way (R/W)/easement requirements and impacts to Navajo Nation lands/grazing	Environmental impacts	Drainage	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
<p>Widen to East Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline.</p> <p>– <i>Eliminated</i> –</p>		<ul style="list-style-type: none">- No impacts to grazing areas.- No easement required.	<ul style="list-style-type: none">- Potential impact to two cultural resources sites considered potentially eligible for the NRHP.- Potential economic impact for relocation of two roadside stands.- Potentially greater disturbance to riparian area associated with Moenkopi Wash than Widen to West Alternative.- Potentially greater visual impacts from the landscape modifications to the landforms associated with the Painted Desert than Widen to West Alternative.- Potential relocation of one residence near MP 477.6.	<ul style="list-style-type: none">- Extensive bank protection may be necessary for the new bridge abutments.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Structure costs greater since a longer bridge is required compared to Widen to West Alternative.- Bank protection costs.
<p>Widen to West Alternative</p> <p>Four-lane divided roadway with 84-foot median with southbound lanes west of existing centerline.</p> <p>– <i>Eliminated</i> –</p>		<ul style="list-style-type: none">- No impacts to grazing areas.- No easement required.	<ul style="list-style-type: none">- Potential impact to two cultural resources sites considered potentially eligible for the NRHP.- Potential economic impact for relocation of two roadside stands.- Potential visual impacts from the landscape modifications to the landforms associated with the “Painted Desert.”	<ul style="list-style-type: none">- Better alignment for parallel bridge at the Moenkopi Wash.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.- Better alignment for parallel bridge at the Moenkopi Wash.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Lower structure costs at Moenkopi Wash.
<p>Widen to East and West Alternative</p> <p>Four-lane divided roadway with 84-foot median with northbound lanes east of existing centerline except at Moenkopi Wash.</p> <p>– <i>Selected</i> –</p>		<ul style="list-style-type: none">- No impacts to grazing areas.- No easement required.	<ul style="list-style-type: none">- Potential impact to two cultural resources sites considered potentially eligible for the NRHP.- Potential economic impact for relocation of two roadside stands.- Potentially greater visual impacts from the landscape modifications to the landforms associated with the “Painted Desert” than Widen to West Alternative.	<ul style="list-style-type: none">- Better alignment for parallel bridge at the Moenkopi Wash.	<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- Accommodates desirable median width of 84 feet.- Better alignment for parallel bridge at the Moenkopi Wash.	<ul style="list-style-type: none">- Easier to construct, with median acting as a "buffer" between traffic lanes and new construction.	<ul style="list-style-type: none">- Lower structure costs at Moenkopi Wash.

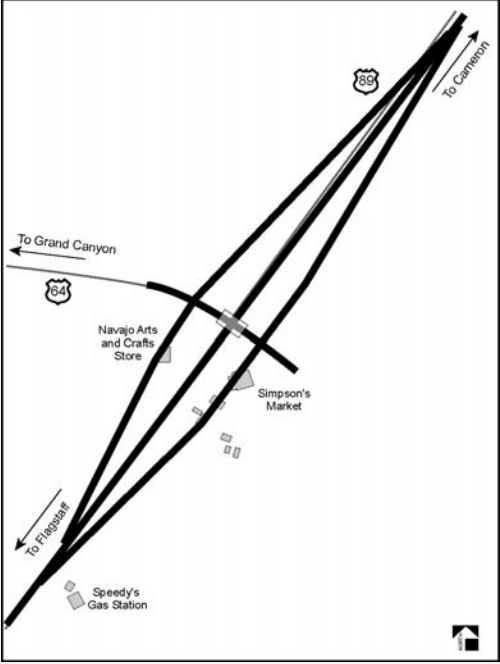
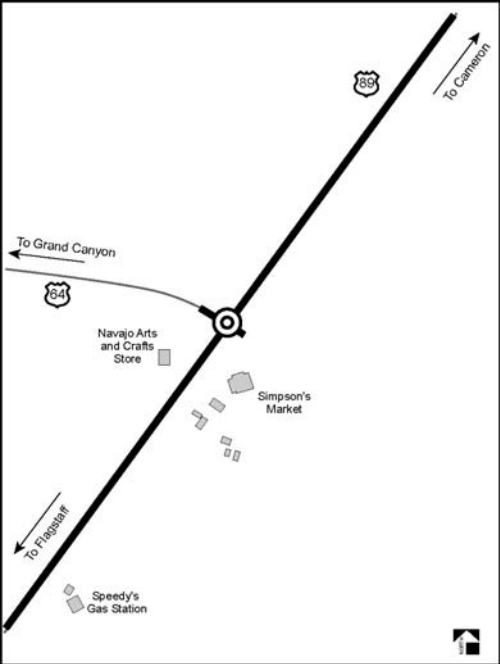
Little Colorado River to Junction US 160 (MP 467.1 – MP 481.9) Build Alternatives (continued)

Consideration		Right-of-way (R/W)/easement requirements and impacts to Navajo Nation lands/grazing	Environmental impacts	Drainage	Utilities	Design to ADOT standards and drivability	Constructability	Cost effectiveness
Alternative								
<div>Old US 89 Highway Alignment Alternative</div> <div>Northbound lanes located on Old US 89 alignment and southbound lanes on existing roadway.</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Isolates land between the old highway easement and existing easement.- R/W/easement required.	<ul style="list-style-type: none">- Portions of Old US 89 easement have not been surveyed for cultural or biological resources.- Potential Individual Section 404 Permit where roadways would cross the same wash at different locations.- Potentially greater disturbance to riparian area associated with Moenkopi Wash than Widen to West or Widen to East Alternatives.- Separation of roadways would maintain existing visual character of two-lane rural highway.- Less visual impact from the landscape modifications to the landforms associated with the “Painted Desert” compared to Widen to West or Widen to East Alternatives.- Potential impact to one known cultural resources site considered potentially eligible for NRHP.	<ul style="list-style-type: none">- Difficult to salvage much of the old roadway grade in the Moenkopi Wash area because of poor alignment.	<ul style="list-style-type: none">- APS power line adjacent to old highway easement.	<ul style="list-style-type: none">- Wide median separates northbound and southbound traffic.- Introduces additional curves into alignment.- Fewer traffic control concerns.	<ul style="list-style-type: none">- Easier to construct, with buffer between traffic and new construction.- Fewer traffic control concerns.	<ul style="list-style-type: none">- Potential easement costs.
<div>Four-lane Undivided Alternative</div> <div>Two lanes in each direction.</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- No impacts to grazing areas.- Existing 400-foot easement adequate to accommodate divided section.	<ul style="list-style-type: none">- Potential impact to two cultural resources sites considered potentially eligible for the NRHP.		<ul style="list-style-type: none">- No apparent conflicts.	<ul style="list-style-type: none">- No median to separate opposing traffic.	<ul style="list-style-type: none">- More difficult to construct.- Traffic control during construction could be an issue.	

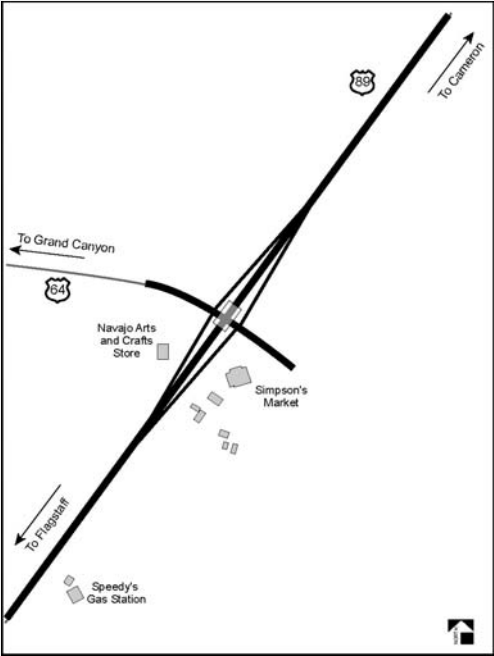
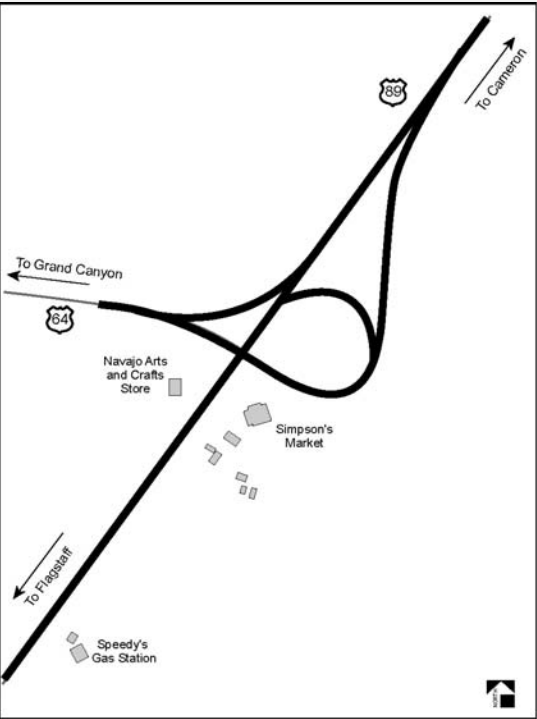
US 89 and SR 64 Intersection Build Alternatives

Consideration		Alternative	Right-of-way (R/W)/easement requirements	Environmental impacts	Impacts to adjacent properties/ businesses	Relative construction cost	Impacts to mainline traffic operations	Construction impacts to US 89	Driver expectations	Impacts to roadway geometrics
Traffic Signal Alternative – Eliminated –			<ul style="list-style-type: none">- None required with reduced typical section width.	<ul style="list-style-type: none">- Pedestrians have a protected signal phase for crossing.- Pedestrian crossings are well delineated.	<ul style="list-style-type: none">- Businesses can remain at their present location; however, uncontrolled access to businesses degrades traffic operations.	<ul style="list-style-type: none">- Signalization costs.	<ul style="list-style-type: none">- Average delay of 9.2 seconds for US 89 through-movement.- At-grade intersection may encourage development adjacent to highway and intersection; increased access points cause conflicts and degraded traffic operations.- Overall intersection would operate at LOS A.- Average intersection delay of 9.0 seconds.- LOS requirements met.	<ul style="list-style-type: none">- Few impacts to traffic.	<ul style="list-style-type: none">- Installation of a traffic signal at isolated location on rural highway can be a safety concern.- Drivers not expecting delay for mainline movements.- Potential for traffic conflicts.	<ul style="list-style-type: none">- Tapers needed to reduce median width.- SR 64 curved approaching intersection; eastbound-to-northbound traffic will likely have to stop before turning.
		Channelized Y Alternative – Eliminated –		<ul style="list-style-type: none">- Easement required (approximately 17 acres).	<ul style="list-style-type: none">- Potential impact to one cultural resources site considered potentially eligible for NRHP.- Economic impact created by loss of four businesses.- Potential relocation of one residence.- Potential hazardous materials from petroleum products and underground storage tanks at commercial businesses.- Pedestrians do not have a protected signal phase for crossing.	<ul style="list-style-type: none">- Businesses on the east side (Simpson's Market, Chevron) would need to be relocated.- New easement line extends through residence behind Chevron.	<ul style="list-style-type: none">- Additional grading for separate left-turn movements.	<ul style="list-style-type: none">- No impact to through-movements.- Eastbound-to-northbound movement would operate at LOS C.- Northbound-to-westbound movement would operate at LOS B or C.- LOS requirements not met.	<ul style="list-style-type: none">- Few impacts to traffic.	<ul style="list-style-type: none">- Drivers not expecting to stop after making left-turn movement.- Left-hand merge and diverge may cause driver confusion.- Potential for traffic conflicts.

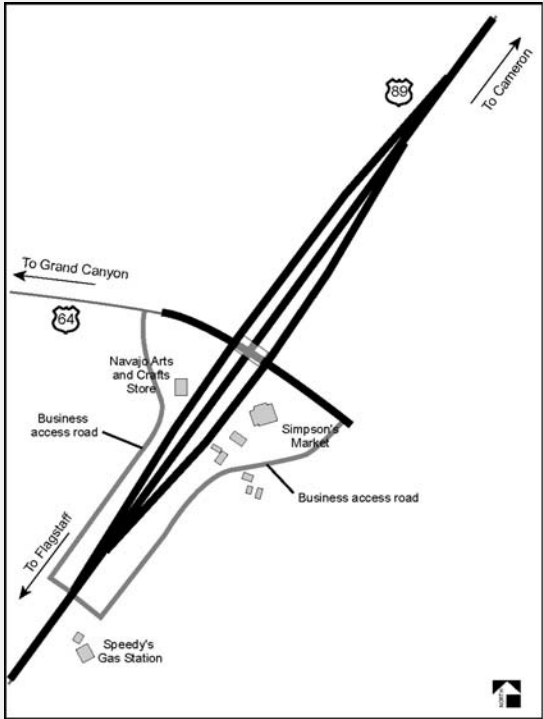
US 89 and SR 64 Intersection Build Alternatives (continued)

Consideration		Right-of-way (R/W)/easement requirements	Environmental impacts	Impacts to adjacent properties/businesses	Relative construction cost	Impacts to mainline traffic operations	Construction impacts to US 89	Driver expectations	Impacts to roadway geometrics
Alternative									
Standard Diamond Traffic Interchange Alternative – Eliminated –		<ul style="list-style-type: none">- Easement required (approximately 26 acres).- Better to grade-separate now for maximized traffic operations than in future when impacts would be greater.	<ul style="list-style-type: none">- Potential impact to one cultural resources site considered potentially eligible for NRHP.- Economic impact created by loss of five businesses.- Potential relocation of one residence and the visitor center.- Potential hazardous materials from petroleum products and underground storage tanks at commercial businesses.- Pedestrians do not have a protected signal phase for crossing except at the crossroad.- An approximately 26-acre easement required from Tribal Park, a Section 4(f) resource.	<ul style="list-style-type: none">- Businesses on both east (Simpson's Market, Chevron) and west side (Navajo Arts & Crafts Center) would need to be relocated.- New easement line extends through residence behind Chevron.- Possible impacts to Speedy's canopy, sign, tanks.	<ul style="list-style-type: none">- Structure and traffic interchange cost relatively high.- Deep structure foundations would likely be required to penetrate surface silts and clay soils.	<ul style="list-style-type: none">- US 89 operates at LOS A northbound and southbound through traffic interchange.- No delay to mainline traffic.- Access points to businesses consolidated, improving overall traffic operations and reducing conflicts.- If ramp/SR 64 intersections are signalized, the intersection would operate at LOS A.- If ramp/SR 64 intersections are stop-controlled, the intersection would operate at LOS B.- LOS requirements met.- Overall delay substantially less than signalized intersection.	<ul style="list-style-type: none">- Some impacts from bridge construction over US 89 traffic if crossroad elevated.	<ul style="list-style-type: none">- Turning movement limited to ramp terminals.- Reduced potential for traffic conflicts.	<ul style="list-style-type: none">- None anticipated.
Roundabout Traffic Interchange Alternative – Selected –		<ul style="list-style-type: none">- No right-of-way required.- Temporary construction easement required.	<ul style="list-style-type: none">- Pedestrians do not have a protected signal phase for crossing.- Pedestrian crossings are well delineated.- Raised medians and splitter islands provide refuge for pedestrians.	<p>Supported by community as improving community definition and slowing traffic.</p> <p>Business access can remain in current location with access similar to signal alternative.</p>	<p>More than the signal alternative, less than any structure.</p> <p>Cost for warning lights, supplemental signing.</p>	<ul style="list-style-type: none">- Slows travel speed and reduces delays for all movements.- Less delay than with signal.- Overall intersection will operate at LOS A.- At-grade intersection may encourage development adjacent to highway and intersection, with increased access points creating conflicts and degrading traffic operations.- Average intersection delay of 4.3 seconds.- Advance warning devices would be warranted to alert approaching vehicles to reduce speed.- Speed reduction and control on the approach to a roundabout would require positive visual warning signals.	<ul style="list-style-type: none">- Detours required during construction	<ul style="list-style-type: none">- Drivers are less familiar with this design.- Accidents at roundabouts are typically less severe than those at signalized intersections due to lower speeds. However, drivers may not be anticipating a roundabout in this rural setting.- Single vehicle accident frequency could possibly increase due to unfamiliarity.- Long-haul may not expect that the US 89 mainline through movement is not given priority in this type of intersection.	<ul style="list-style-type: none">- At-grade intersection. No vertical curves introduced to mainline or cross road.- Curvature of approaches and exits will slow down vehicles by design.

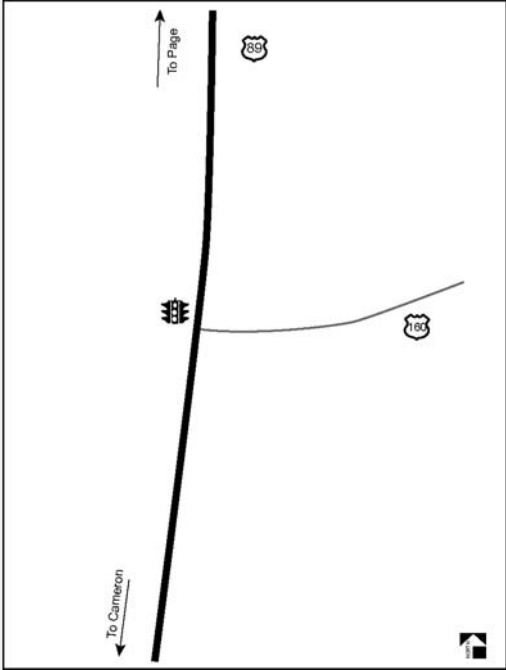
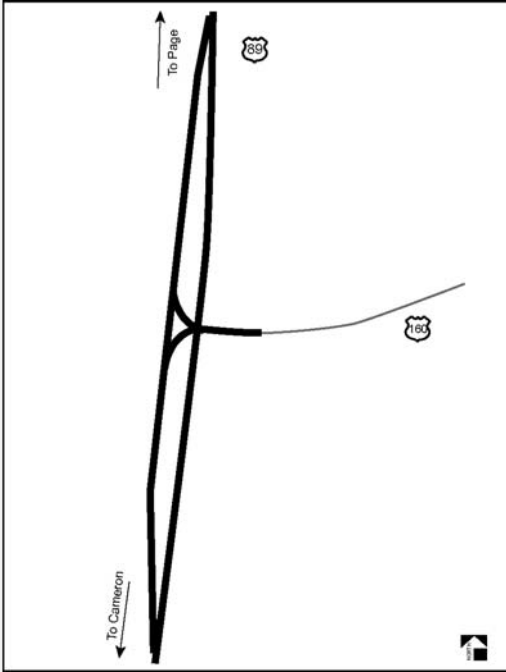
US 89 and SR 64 Intersection Build Alternatives (continued)

Alternative	Consideration	Right-of-way (R/W)/easement requirements	Environmental impacts	Impacts to adjacent properties/businesses	Relative construction cost	Impacts to mainline traffic operations	Construction impacts to US 89	Driver expectations	Impacts to roadway geometrics
Single Point Urban Diamond Traffic Interchange Alternative – Eliminated –		<ul style="list-style-type: none">- Minimal easement required (for east side crossroad extension).- Easement available and conflicts with planned development.- Better to grade-separate now for maximized traffic operations than in future when impacts would be greater.	<ul style="list-style-type: none">- Notable change in visual character created by the elevated structure.- Reconfiguration of access to business and residences required.- Potential economic impact to existing businesses.- Pedestrians have a protected signal phase for crossing on the crossroad.	<ul style="list-style-type: none">- Access to businesses on both sides of US 89 would need to be relocated.- Potential economic impact to existing businesses.	<ul style="list-style-type: none">- Structure and traffic interchange wall costs high.- Deep structure foundations would likely be required to penetrate surface silts and clay soils.	<ul style="list-style-type: none">- US 89 operates at LOS A northbound and southbound through traffic interchange.- No delay to mainline traffic.- Access points to businesses consolidated, improving overall traffic operations and reducing conflicts.- If ramp/SR 64 intersections are signalized, the intersection would operate at LOS A.- LOS requirements met.- Overall delay substantially less than signalized intersection.	<ul style="list-style-type: none">- US 89 would be elevated.- Major impacts to US 89 traffic during construction; detour required.	<ul style="list-style-type: none">- Drivers may not be familiar with operations of a single point urban diamond traffic intersection.	<ul style="list-style-type: none">- Vertical curves introduced to mainline.
Jug Handle Traffic Interchange Alternative – Eliminated –		<ul style="list-style-type: none">- Easement required (approximately 11 acres).- Easement available and conflicts with planned development.- Better to grade-separate now for maximized traffic operations than in future when impacts would be greater.	<ul style="list-style-type: none">- Notable change in visual character created by the elevated structure.- Reconfiguration of access to businesses and residences required.- Section 404 permit/ 401 certification required at wash as result of construction of service road.- Potential economic impact to existing businesses because of change in access and access control by presence of median.- Pedestrians do not have a protected signal phase for crossing.- An approximately 11-acre easement required from Tribal Park, a Section 4(f) resource.	<ul style="list-style-type: none">- Businesses can remain in their existing locations; however, access to businesses on both sides of US 89 relocated/consolidate.- Impacts to future development plans in northeast quadrant.	<ul style="list-style-type: none">- Structure and traffic interchange wall costs high.- Deep structure foundations would likely be required to penetrate surface silts and clay soils.	<ul style="list-style-type: none">- US 89 would operate at LOS A northbound and southbound through traffic interchange.- No delay to mainline traffic.- Access points to businesses consolidated, improving overall traffic operations and reducing conflicts.- Merges/diverges operate at LOS B.- LOS requirements met.- Overall delay substantially less than signalized intersection.	<ul style="list-style-type: none">- US 89 to be at-grade; SR 64 to be elevated over US 89. Some impacts from bridge construction over US 89 traffic when crossroad is elevated.	<ul style="list-style-type: none">- Drivers traveling northbound not expecting to exit to the right to make a left-turn movement.- Better meets expectations on eastbound-to-northbound movement because drivers no longer required to stop after rounding curve on approach to US 89.- Reduced potential for traffic conflicts.	<ul style="list-style-type: none">- Design speed for loop ramp would be 30 mph.- No additional horizontal or vertical curves introduced to mainline.- SR 64 curved approaching intersection; eastbound-to-northbound traffic has a through-movement rather than a stop sign.

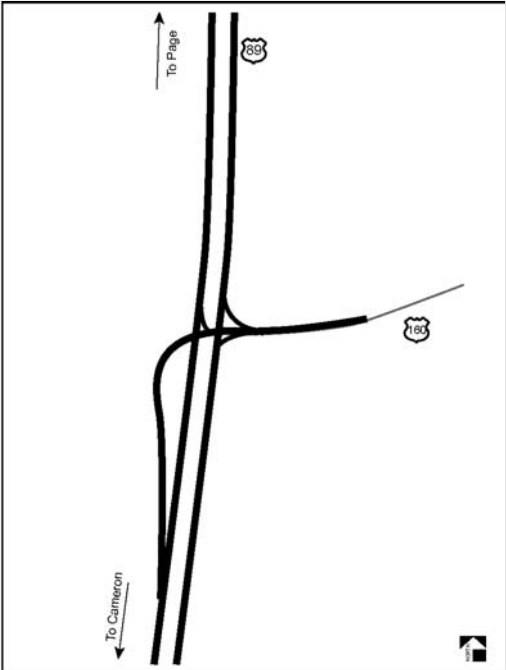
US 89 and SR 64 Intersection Build Alternatives (continued)

Consideration		Right-of-way (R/W)/easement requirements	Environmental impacts	Impacts to adjacent properties/businesses	Relative construction cost	Impacts to mainline traffic operations	Construction impacts to US 89	Driver expectations	Impacts to roadway geometrics
Alternative									
<div>Compact Diamond Traffic Interchange Alternative</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Minimal easement required (for east side crossroad extension).- Easement available and conflicts with planned development.- Better to grade-separate now for maximized traffic operations than in future when impacts would be greater.	<ul style="list-style-type: none">- Notable change in visual character created by the elevated structure.- Reconfiguration of access to businesses and residences required.- Section 404 permit/401 certification required at wash as result of construction of service road. Potential economic impact to existing businesses.- Pedestrians do not have a protected signal phase for crossing except at the crossroad.	<ul style="list-style-type: none">- Access to businesses on both sides of US 89 would need to be relocated.- Potential economic impact to existing businesses.	<ul style="list-style-type: none">- Structure and traffic interchange wall costs high.- Deep structure foundations would likely be required to penetrate surface silts and clay soils.	<ul style="list-style-type: none">- US 89 would operate at LOS A northbound and southbound through traffic interchange.- No delay to mainline traffic.- Access points to businesses consolidated, improving overall traffic operations and reducing conflicts.- If ramp/SR 64 intersections are signalized, the intersection would operate at LOS A.- LOS requirements met.- Overall delay substantially less than signalized intersection.	<ul style="list-style-type: none">- US 89 to be at-grade; SR 64 to be elevated over US 89. Some impacts from bridge construction over US 89 traffic when crossroad is elevated.	<ul style="list-style-type: none">- Turning movements limited to ramp terminals.- Reduced potential for traffic conflicts.	<ul style="list-style-type: none">- None anticipated.

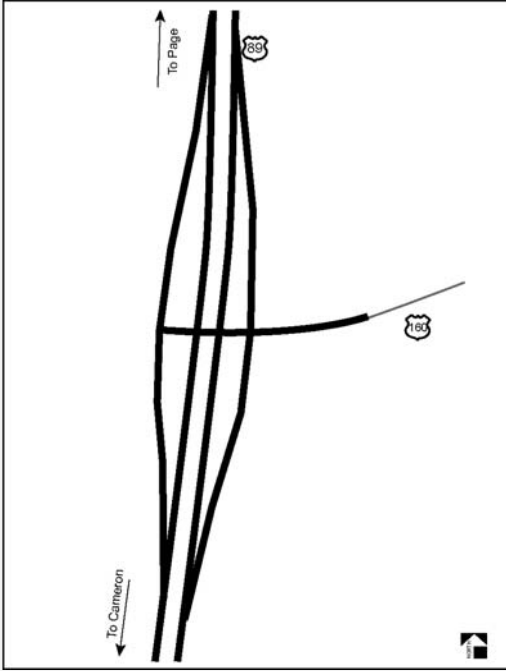
US 89 and US 160 Intersection Build Alternatives

Consideration		Right-of-way (R/W)/easement requirements	Environmental impacts	Impacts to adjacent properties/businesses	Relative construction cost	Impacts to mainline traffic operations	Construction impacts to US 89	Driver expectations	Impacts to roadway geometrics
Alternative									
Traffic Signal Alternative – Eliminated –		- No easement needed.	- No initial environmental concerns.	- Future development not precluded near intersection; however, US 89 traffic operations would be degraded by uncontrolled access to businesses.	- Signalization costs.	- Average delay of 15 seconds for westbound-to-southbound turning movement. - At-grade intersection may encourage development adjacent to highway and intersection; increased access points create conflicts and degraded traffic operations. - Southbound and westbound approaches would operate at LOS B in design year 2025. - All turning movement would operate at LOS A or B. - Average intersection delay of 9.4 seconds. - LOS requirements met.	- Minor impacts.	- Installation of a traffic signal at isolated location on rural highway can be a safety concern. - Drivers not expecting delay for mainline movements. - Potential for traffic conflicts.	- US 160 curved approaching intersection; westbound-to-southbound traffic would likely stop before turning.
		- Easement needed (approximately 5 acres; 5.5 acres on Tribal Park, zero east side). - Easement is available and undeveloped with minimal economic impact and cost	- Notable visual impacts from the landscape modifications to the landforms associated with the "Painted Desert." - Section 404 permit/ 401 certification required at drainage crossing. - An approximately 5.5-acre easement required from Tribal Park, a Section 4(f) resource.	- Minor modifications would be required to accommodate potential future development on west side of intersection (all intersections would be at-grade).	- More than Traffic Signal Alternative, but less than alternatives with structures.	- No delay to mainline. - Westbound-to-southbound would operate at LOS C. - Southbound-to-eastbound turning movement would operate at LOS B. - Overall intersection would operate at LOS C. - LOS requirements not met.	- Minor impacts.	- Drivers not expecting to stop after making the left-turn movement. - Left-hand merge and diverge may cause driver confusion. - Potential for traffic conflicts.	- Additional horizontal curves added to northbound US 89 alignment.

US 89 and US 160 Intersection Build Alternatives (continued)

Consideration		Right-of-way (R/W)/easement requirements	Environmental impacts	Impacts to adjacent properties/businesses	Relative construction cost	Impacts to mainline traffic operations	Construction impacts to US 89	Driver expectations	Impacts to roadway geometrics
Alternative									
<div>Modified Channelized Y Alternative</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Easement needed (approximately 10 acres; 5.5 acres on Tribal Park & 4.5 on east side).- Easement is available and undeveloped with minimal economic impact and cost.	<ul style="list-style-type: none">- Notable visual impacts from the landscape modifications to the landforms associated with the “painted desert”.- Notable change in visual character created by northbound elevated structure on the mainline.- Potential impact to planned development on the northeast quadrant of the intersection from easement acquisition.- Section 404 permit/ 401 certification required at drainage crossing.- An approximately 5.5-acre easement required from Tribal Park, a Section 4(f) resource.	<ul style="list-style-type: none">- Access to potential future development from raised section of US 89 would be precluded (access could be provided via US 160).- Southbound US 89 traffic would not see development on east side of raised section of US 89.- Modifications necessary, but could be converted to diamond-type interchange in the future.	<ul style="list-style-type: none">- High structure costs.	<ul style="list-style-type: none">- No delay to mainline.- Westbound-to-southbound turning movement would operate at LOS A.- Southbound-to-eastbound turning movement would operate at LOS B.- Overall delay substantially less than signalized intersection.- LOS requirements met.	<ul style="list-style-type: none">- Minor impacts to US 89; however, greater impacts to US 160 traffic as northbound US 89 structure is constructed overhead.	<ul style="list-style-type: none">- Drivers not expecting to stop after making the left-turn movement.- Potential for traffic conflicts.	<ul style="list-style-type: none">- Vertical curves introduced to mainline.
<div>Westbound Flyover Alternative</div> <div>– Eliminated –</div>		<ul style="list-style-type: none">- Easement needed (approximately 3 acres on Tribal Park, zero on east side).- Easement is available and undeveloped with minimal economic impact and cost.- Better to grade-separate now for maximized traffic operations than in the future when impacts greater.	<ul style="list-style-type: none">- Section 404 permit/ 401 certification required at drainage crossing.- An approximately 3-acre easement required from Tribal Park, a Section 4(f) resource.- Notable change in visual character created by elevated structure over the mainline.	<ul style="list-style-type: none">- Future access to extended US 160 west of the US 89 or future diamond traffic interchange precluded.	<ul style="list-style-type: none">- Widened US 160 required.- Deep structure foundations would likely be required to penetrate surface silts and clay soils.- High structure costs.	<ul style="list-style-type: none">- No delay to mainline.- Westbound-to-southbound merge would operate at LOS B.- All other movement operates at LOS A.- Overall delay substantially less than signalized intersection.- LOS requirements met.	<ul style="list-style-type: none">- Impacts to US 89 traffic as bridge is constructed overhead.- Major impacts to US 160 traffic; detour required.	<ul style="list-style-type: none">- Turning movement limited to ramp terminals.- Reduced potential for traffic conflicts.	<ul style="list-style-type: none">- None anticipated.

US 89 and US 160 Intersection Build Alternatives (continued)

Consideration		Right-of-way (R/W)/easement requirements	Environmental impacts	Impacts to adjacent properties/businesses	Relative construction cost	Impacts to mainline traffic operations	Construction impacts to US 89	Driver expectations	Impacts to roadway geometrics
Alternative									
Standard Diamond Traffic Interchange Alternative – <i>Selected</i> –		<ul style="list-style-type: none">- Easement needed (approximately 15 acres ; 6.5 on Tribal Park, 8.5 on east side).- Easement is available and undeveloped with minimal economic impact and cost.- Better to grade-separate now for maximized traffic operations than in the future when impacts greater.	<ul style="list-style-type: none">- Section 404 permit/ 401 certification required at drainage crossing.- An approximately 6.5-acre easement required from Tribal Park, a Section 4(f) resource.- Notable change in visual character created by elevated structure over the mainline.	<ul style="list-style-type: none">- Potential future development accommodated on both east and west sides of US 89.	<ul style="list-style-type: none">- High structure costs.- Widened US 160 required.- Deep structure foundations would likely be required to penetrate surface silts and clay soils.	<ul style="list-style-type: none">- No delay to mainline.- US 89 operates at LOS A northbound and southbound through traffic interchange.- With signalized ramp/US 160 intersections, the traffic interchange operates at LOS A.- With stop-controlled ramp/ US 160 intersection, the intersection operates at LOS D for southbound-to-westbound movement.- Overall delay substantially less than signalized intersection.	<ul style="list-style-type: none">- Impacts to US 89 traffic during bridge construction.- Major impacts to US 160 traffic; detour would be required.	<ul style="list-style-type: none">- Conflicting turning movements eliminated.- Reduced potential for traffic conflicts.- Better meets expectations on westbound-to-southbound movement since drivers would no longer be required to stop after rounding curve on approach to US 89.	<ul style="list-style-type: none">- No additional horizontal and vertical curves would be introduced to mainline.- US 160 curved approaching intersection; westbound-to-southbound traffic would not have to stop before turning.